REMARKS

Claims 1-19, as amended, are presented for examination. Reconsideration is respectfully requested. New claims 15 to 19 are added to more completely claim the invention. Claim 15 was added in the parent case and was allowed.

In the present application, claim 1 stands rejected under 35 USC 102. Claim 14 stands rejected under 35 USC 112 for incorrect dependency. Claims 2-10, 13, and 15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form, including all of the limitations of the base claim and any intervening claims.

Claim 14 has been amended to correct the dependency. Applicants will rewrite claims 2-10, 13, and 15 later, if claim 1 and new claims 16-19 are not allowable. However, Applicants believe that amended claim 1 is allowable, as described below.

The present invention, as claimed in claim 1, is a method including the step of disaggregating asphaltenes in petroleum oils and mixtures thereof by heating so that the aggregates remain soluble. This aspect of the invention includes three limitations: (1) disaggregation of asphaltenes (2) mild heating of the entire petroleum oil feestream to disaggregate the asphaltenes and (3) the disaggregated asphaltenes remain soluble in the petroleum oils.

The Examiner has alleged that claim 1 is anticipated by Sung et al., U.S. 5,969,237 because Sung discloses heating a drop of oil while using the ASTM D 2781 test method. The Examiner believes that the use of the test by Sung inherently discloses that the heating of petroleum feedstreams will disaggregate asphaltenes in the

Designation: D 2781 – 88

An American National Standard

Standard Test Method for Compatibility of Fuel Oil Blends by Spot Test[1]

This standard is issued under the fixed designation D 2781; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers two spot test procedures for rating a residual fuel oil with respect to its compatibility with a specific distillate fuel oil. Procedure A indicates the degree of asphaltene deposition that may be expected in blending the components. This procedure is used when wax deposition is not considered a fuel application problem. Procedure B indicates the degree of wax and asphaltene deposition in the mixture at room temperature. This procedure is used when wax deposition is considered a fuel application problem.

1.2 This test method is applied to a 50-50 blend of the component fuel oils where the viscosity of the blend is between approximately 15 and 45 cSt (1 cSt = 1 mm^2/s) at 38°C (100°F).

NOTE 1—This blend approaches the most severe conditions for measuring compatibility and its viscosity is in the proper range for satisfactory development of the spot under the conditions of the test.

1.3 This test method is valid for predicting the compatibility of the two components for blending into intermediate marine diesel fuels.

NOTE 2—Components that are compatible in the 50-50 test blend may not be compatible when marine diesel fuel is diluted with a higher percentage of distillate fuel oil.

1.4 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

1.5 The value stated in SI Units are to be regarded as the standard. The values given in parentheses are for information only.

2. Referenced Documents

2.1 *ASTM Standards:*

D 396 Specification for Fuel Oils[2]

D 4057 Practice for Manual Sampling of Petroleum and Petroleum Products[3]

2.2 *ASTM Adjunct:*

Reference Spot Sheet (D 2781)

3. Summary of Test Method

3.1 *Procedure A*—Equal volumes of the residual fuel oil and the distillate fuel oil are blended at 65°C (149°F). A drop of the blend is allowed to spread on chromatographic paper of a specified grade rated at 65°C (149°F). The spot thus formed is compared with a series of numbered reference spots. The compatibility of the components is rated on the basis of this comparison.

3.2 *Procedure B*—This procedure is the same as Procedure A except the spot is developed at a temperature of 20°C (68°F).

4. Significance and Use

4.1 Two fuels, each of which is stable alone, when mixed together may make a fuel that is not stable. An unstable blend will contain precipitated material that was soluble in one of the component fuels. When the blend is unstable the fuels are incompatible. The unstable fuel will cause deposits to be formed.

4.2 This test method is used as a pass/fail test method.

5. Descriptions of Terms Specific to This Standard

5.1 *compatibility*—the absence of suspended solids in fuel oil blends under the conditions of the test.

5.2 *compatibility rating*—the assigned numerical value of the reference spot which most closely resembles the spot produced under the conditions of the test.

5.3 *distillate fuel oil*—a virgin, a cracked, or a blend of virgin and cracked distillate, generally but not necessarily conforming to the requirements for Grade No. 2 Fuel Oil given in Table 1 of Specification D 396.

5.4 *intermediate marine diesel fuels*—blends of residual fuel oil and distillate fuel oil, usually containing 5 to 50 % distillate fuel oil.

5.5 *residual fuel oil*—Grade No. 6 Fuel Oil or any fuel oil containing residual components.

NOTE 3—When the residual fuel oil has a viscosity between 50 and 200 cSt at 50°C (122°F), the resulting blend may be too low in viscosity for satisfactory application of the test.

6. Interferences

6.1 Water in concentrations normally encountered does not interfere.

[1] This test method is under the jurisdiction of ASTM Committee D-2 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.05 on Properties of Fuels, Petroleum Coke, and Oil Shale.

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[2] *Annual Book of ASTM Standards*, Vol 05.01.

[3] *Annual Book of ASTM Standards*, Vol 05.03.

[4] Reference spot sheets are available at a nominal cost from ASTM Headquarters, 1916 Race St., Philadelphia, PA 19103. Request Adjunct No. 12-427810-00.

TABLE 1 Reference Spot Description

Reference Spot No.	Characterizing Features
1	Homogeneous spot (no inner ring)
2	Faint or poorly defined inner ring
3	Well defined, thin, inner ring, only slightly darker than the background
4	Well defined inner ring, thicker than the ring in reference spot No. 3 and somewhat darker than the background
5	Very dark solid or nearly solid area in the center. The central area is much darker than the background.

6.2 Solids existent in the component fuels will contribute to the deposit on the test paper.

7. Apparatus

7.1 *Water Bath*, capable of maintaining a temperature of 65°C (149°F) and of such dimensions as to permit immersion of the mixing jar to within 38 mm (1.5 in.) of its top.

7.2 *Mixing Jar*—A wide-mouth, 250 mL (8 oz) glass jar equipped with a sealing lid, and having etched lines corresponding to contained volumes of 50 and 100 mL.

7.3 *Glass or Polyethylene Rod*, 180 to 190 mm (7.0 to 7.5 in.) long and 4 to 5 mm (0.16 to 0.20 in.) in diameter.

7.4 *Test Paper*[5]—Chromatographic paper cut into 50-mm (2-in.) squares. Store the squares, without folding, rolling, or bending, in a tightly closed container.

7.5 *Thermometer*—The type of thermometer is not critical except that the range should include temperatures from 20 to 65°C (70 to 149°F).

7.6 *Hot Plate or Oven* capable of heating to a temperature of 65°C (149°F).

8. Sampling

8.1 Separately collect the samples of the components as directed in Practice D 4057.

9. Procedure A

9.1 *To Eliminate Wax Deposition in Spot Formation*—With both fuel oil components at approximately the same temperature, fill the mixing jar to the lower mark with the distillate fuel oil; then add the residual fuel oil until the liquid level coincides with the upper mark.

9.2 Close the jar and shake it vigorously for approximately 10 s. Immerse it to within 40 mm (1.5 in.) of its top in the bath at 65°C (149°F), weighting the jar, when necessary, to prevent it from floating.

9.3 After 15 to 20 min, remove the jar from the bath, and shake it vigorously for at least 3 min.

9.4 Reheat the sample to 65°C (149°F) and spot immediately on test paper at room temperature as directed in 9.5.

9.5 Conduct the operations described in this paragraph in duplicate in an area shielded from direct drafts. Remove a test paper square from the storage container. Support the paper in a horizontal position over a hot plate or in an oven so that nothing touches it except near the edges. Remove the mixing jar from the bath, and shake the jar for 5 s. Remove the lid from the jar, insert the glass rod to the bottom of the jar, and stir the sample with the rod for approximately 5 s. Lift the rod from the jar, being careful not to touch the sides, and allow *the first drop* of liquid to fall from the rod into the sample. Immediately move the rod to a vertical position with the tip about 12 mm (0.5 in.) above the center of the test paper, and allow *the second drop* to fall on the test paper.

9.6 Allow the spot to dry for 60 min at 65 ± 3°C (149 ± 5°F); then compare the test spot with the reference spots.[4] Using Table 1 as a guide, select the reference spot that most nearly matches the test spot. Ignore differences in overall darkness, color, spot size, and appearance of the outer edges. Record the number assigned to the reference spot as the Compatibility Rating.

NOTE 4—Use of an infrared lamp to keep the space warm may be helpful for avoiding high melting wax crystals.

10. Procedure B

10.1 *To Permit Wax Deposition in Spot Formation*—Proceed as directed in 9.1 through 9.3; then allow the jar and contents to stand undisturbed for 4 h at a temperature from 20 to 25°C (68 to 77°F). Continue as directed in 9.5 and 9.6, spotting the sample at 20 to 25°C with the filter paper at 23.9 ± 3°C (75 ± 5°F).

11. Interpretation of Results

11.1 A No. 1 rating indicates compatibility (no suspended solids). For ratings above No. 1 the higher the numerical value, the greater the departure from compatibility (increasing amount of suspended solids). A No. 3 rating or above indicates that a fuel oil blended from these components may cause problems in field application such as excessive centrifuge loading, strainer plugging, and tank deposits.

11.2 If a No. 1 rating, for example, is obtained when the blend is spotted as in Procedure A, and a No. 3 or higher rating is obtained by spotting as in Procedure B, the poorer rating may be attributed to crystallized wax and not to asphaltenes. If a spot rating greater than No. 1 is obtained in both cases, the presence of insoluble asphaltenes or sediment is indicated.

12. Report

12.1 Report the Compatibility Rating as an integer from 1 to 5. Indicate whether Procedure A or Procedure B was used.

13. Precision and Bias

13.1 *Precision*—It is not practicable to specify the precision of the procedure in this test method because with this type of test data or results from other qualitative tests, no generally accepted method for determining precision is currently available.

13.2 *Bias*—Since there is no accepted reference material suitable for determining bias for this test method, no statement on bias is being made.

[5] This method was originally based on the use of Grade No. 2040a, available from Carl Schleicher and Schuell Co., Keene, N. H. No. 2 Whatman or equivalent filter paper is satisfactory.